COVER SHEET

1. **Specify**: This is a **joint** application for an **urban project**
2. **Proposal Title:** Demonstration Of Water Conservation Opportunities In Urban Supermarkets.
3. **Principal Applicant:** Aquacraft, Inc. Water Engineering and Management
4. **Contact Name:** Mr. William B. DeOreo, P.E.
5. **Mailing Address:** 2709 Pine Street Street, Boulder, CO 80302
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8. **E-mail:** deoreo@aquacraft.com
9. **Funds Requested:** $126,000
10. **Applicant Co-share:** $54,000
11. **Duration of Project:** 18 months
12. **State Assembly Districts:**
    Assembly Districts: 38,39,41, 44, 49,51-55, 57, 58, 59, 60, 64, 65, 66, 70, 71, 80
    Senate Districts: 19-28, 21,23, 24, 29, 30, 31, 33, 35, 36, 37
    Congressional Districts: 27, 28, 29, 31, 33, 34, 39, 41, 43, 44, 47, 48
    EMWD, UPSGVMWD, IRWD, Santa Monica,
13. **Location and Geographic Boundaries of Project:** Will be in the service areas of the following MWD member agencies: Irvine Ranch Water District, Eastern Water District, City of Santa Monica Water Department, Los Angeles Department of Water and Power, Upper San Gabriel Valley MWD: covering the cities of Los Angeles and surrounding communities, Santa Monica, Baldwin Park, El Monte, South El Monte, West Covina, San Gabriel, Rosemead, Temple City, Arcadia, South Pasadena, La Puente, Duarte, Irvine, Lake Forest, Hemet, Temecula, Murrieta, San Jacinto, Perris, Canyon Lake, Moreno Valley and parts of surrounding areas.
14. **Name and signature of official representing applicant.** By signing below, the applicant declares the following:
    a. the truthfulness of all representations in the proposal;
    b. the individual signing the form is authorized to submit the application on behalf of the applicant;
    c. the applicant will comply with contact terms and conditions identified in Section 11 of this PSP

____________________________ _______________________
Printed Name of Applicant Date

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Signature of Applicant

SCOPE OF WORK

Abstract

This proposal is for a demonstration project of the technical and economic effectiveness of a range of water conservation measures for urban supermarkets. These facilities are an important segment of overall commercial water use throughout the State of California, and the typical store uses an average of 12 million gallons of water per year. The largest single water user in these stores is the evaporative condenser which transfers heat from the refrigeration system to the atmosphere. This will be the main target of this study. Three promising technologies will be investigated to determine their effectiveness in reducing bleed-off water from the evaporative condensers in a number of stores. The water use and operational performance of the systems will be monitored before and after the installation. Energy use will also be tracked. In addition a number or measures will be employed in the other areas of the store (high efficiency plumbing fixtures, faucet controllers, leak detection and repair). It is hoped that the information obtained in this study will provide credible data on the economic benefits of these technologies; thus increasing their use throughout the state.

Statement of Critical Interest

It is well documented that Supermarkets are major water and energy users, consuming an average of 12,000 gpd per store in typical Southern California conditions, as shown by recent work by the American Water Works Association Research Foundation[1]. It is also known that in typical supermarkets the major water demand is for operation of the cooling equipment, which can account for over 60% of the total in-store use. While there are several promising technologies for reducing water use in cooling equipment and other in-store uses barriers exist which impede their wide adoption. A small scale, but credible study of these technologies could greatly expand their adoption, and have a major ripple effect in water conservation efforts throughout all of California. Water savings on this broad front is clearly a critical opportunity for the State, and one which we believe should be fostered. This proposal directly addressed BMP No. 9 which involves improvement of the water use efficiency of commercial and industrial users.

The fact that supermarkets are a fairly standardized type of customer with the almost ubiquitous presence of evaporative cooling equipment makes them a good target for a water conservation demonstration project. The concept for the project being proposed here, is that a number of supermarkets be investigated to obtain more accurate information on their baseline water use patterns, and then to modify them with the best available water conservation technology (focussing mainly on the evaporative coolers). After the conservation work is complete, their performance will be monitored for a period of 12 months to determine what changes have occurred in normalized water demands. Data will also be collected on energy consumption in the stores during the pre and post intervention period. A quality control process will be conducted to evaluate whether the

[1] Dziegielewsk, et al *Commercial and Institutional End Uses of Water*. AWWARF, 2000, see pg 80

changes have resulted in any deterioration in the quality of the service provided by the water fixtures, and on the state of the scaling or corrosion of the evaporative coolers.

The benefits of this program could be very significant for the State of California. Because supermarkets are so ubiquitous any technologies which could be demonstrated to save water and energy in an economic manner, would find wide application throughout the state. A lack of impartial information about the safety and effectiveness of these technologies creates a barrier to their implementation. A major goal of this study would be to provide this information in a manner which gives users a basis on which to make an intelligent decision about how to proceed.

In the AWWARF Study, "Commercial and Institutional End Uses of Water", supermarkets were chosen as one of the CI study sectors because of there significance as water users and the potential that they offered for saving a large amount of water through a fairly simple intervention process. As part of this study five supermarkets were visited to obtain baseline data. Four of these were in the MWD service area and 1 was in Phoenix. All were very similar in design and the services they provided. A summary of the relevant information about the supermarkets is shown in Table 1.

Table 1: Supermarket Data from Southern California

Parameter	Irvine	Los Angeles	San Diego	Santa Monica
Store Size (sf)	38000	50000	66000	45000
Transactions/Day	3900	3300	3150	3300
Cooling Cap (tons)	200	200	260	240
Conc. Ratio (TDS)	2.7	1.9	2.2	3.3
Annual Water Use (kgal)	3934	5072	3877	4311
Ave Daily Use (kgal)	10.8	13.9	10.6	11.8
Annual Cooling Use (kgal)	2234	3390	2560	2190
Percent Used for Cooling	57%	67%	66%	51%

This table shows that the typical southern California supermarket is between 38,000 and 66,000 square feet in size and performs from 3000 to 4000 transactions per day. These stores have a cooling capacity from 200 to 260 tons and devote from 50% to 70% of their total indoor use to cooling. The evaporative coolers are typically run at concentration ratios that range from 1.9 to 3.3.

In a cooling tower water is used for two purposes: to evaporate into the atmosphere, thus dissipating heat from the system, and to carry remaining salts and other solids away from the tank into the wastewater system. There is little that can be done about the water used for evaporation, since this is a function of the heat load on the system and the weather conditions. Water used for salt removal, commonly referred to as bleed-off, can be affected by the amount of solids which are allowed to build up in the water circulating in the system. This is frequently expressed as the ratio of the TDS of the circulation water to that of the make up water, or concentration ratio, or concentration ratio (CR).

For a given evaporation rate, the amount of water used for bleed-off is inversely proportional to the value of the concentration ratio as described by the equation, B= E/(CR-1), where B= the bleed-off volume, E= the evaporation water use, and CR = the concentration ratio. Consequently, if one can increase the concentration ratio for a given tank, then its water use will be decreased. The problem with this approach is that operating the tank at too high a concentration ratio creates the possibility of scale formation which can damage or greatly decrease the efficiency of the system. At the other extreme, corrosion can occur if the system is run at too low a pH or with other chemical conditions in an attempt to prevent scale formation. Without belaboring this point, let us say that there is an opportunity to reduce water consumption in most evaporative coolers if they can be run at higher concentration ratios compared to the typical ratios found in the CIEUWS of 3.3 or less. However, in order to do this it is necessary to demonstrate that the technology is present which will allow the systems to operate in the CR range of 7 without damage, and that they are economical to install and operate.

The other water use in most supermarkets is a mixture of food preparation, bathroom and other sanitary uses, leaks, general washing of the premises, produce washing and spray down and water treatment equipment. Without extensive submetering it is difficult to estimate precisely how much of the non-cooling water use goes to each of these purposes, but experience has shown that the most amenable to conservation are the leaks, sanitary uses and food preparation sinks.

Objective of Project

The goal of this study is to obtain credible information as part of a demonstration project on application of the best available technology for water conservation in supermarkets. This information will be then be used to perform economic evaluations of the processes in terms of present costs and benefits to both the store owners and the utilities. A set of recommended water conservation practices will be developed along with information on their costs and benefits. The economic analysis will include both that of the owner and the water provider so that possible cost-sharing plans can be developed. Ultimately the goal of the project is to accelerate the adoption of water conservation technologies by the supermarket sector by providing information that will help overcome the natural reluctance to adopt new practices.

Methods

Each participating agency will choose one or more supermarkets for participation in the study. We are planning on a total of 6 stores within the five agencies included in the study. Each store will first have extensive data collected on their baseline water and energy use. The stores will be retrofit with the best available technology for conservation in cooling, sanitary and other in-store uses. During a 12 month period following the retrofits the water and energy use will be monitored closely at each store. Data on total and normalized water and energy use will be collected, and statistical analyses performed to determine whether savings have occurred, which can be attributed to the water conservation technologies applied in the stores.

Selection of Study Sites

It will be the responsibility of each participating agency to identify one or more stores in their service area to participate in the study. In order to maximize the impact of the study larger chains will be sought as a priority[2]. If the study has the anticipated results, and shows that water conservation technologies are cost effective, then the large chains will be positioned to implement the technologies on a large scale. Their dominance in the market will create a momentum for this technology that will help bring standardize it throughout the industry.

Collection of Baseline Data

A complete year of baseline water and energy consumption will be obtained for each store. Accurate information will also be obtained on the physical characteristics of each store, the types of services and departments present, its size, and the number of transactions during each month of the historical period.

Each store will be visited and an on site audit will be performed. During this audit a data logger will be attached to the main water meter so that a two week flow trace can be obtained. The flow trace data, in conjunction with the other information obtained during the audit will be used to disaggregate the uses of water. Prior to the audit, each store will have a magnetically driven water meter installed on the feed line to the evaporative condenser. This will be in addition to any other meter currently on the system. This meter will be used to obtain synchronous flow trace data with the main meter using the same data logging equipment. This will allow an accurate comparison to be made in total water use and water used for cooling. By subtraction we will be able to generate an accurate picture of water use for all other purposes in the store.

The evaporative cooling equipment will be carefully inspected and the following information will be obtained and recorded:

1. Make and model of unit,
2. All chemicals and treatment processes currently used,
3. Type of controls used for bleed-off,
4. Conductivity of make-up water,
5. Conductivity and temperature of recirculation water,
6. The saturation index of the circulating water,
7. Cooling loads during summer, winter and annual average,
8. Water quality reports,
9. Types and location of water meters present,
10. Condition of system with respect to biological growth,
11. Condition of system with respect to scaling or corrosion.
12. Maintenance history of system.

The remainder of the store will be audited with respect to the number and types of fixtures and appliances present so that the necessary retrofit equipment can be ordered. A survey will be filled out by the store manage and maintenance personnel giving their

[2] Such as Alberstons, Ralphs, Luckies or Stater Brothers

input on the performance of the existing fixtures, appliances and cooling equipment in the store. This will solicit information on frequency of repairs and issues such as toilet and faucet failures. The company which currently manages the evaporative cooler will be interviewed as well to obtain the data required for the cooling tower audit.

Retrofit

Once all baseline data are obtained the store will be retrofit with the best available water conservation technology. This will include: equipment allowing the cooling towers to operate at a minimum concentration ratio of 7. All rinse sinks, food preparation and hand washing faucets will be equipped with hands free controllers and high efficiency nozzles. All toilets will be replaced with the highest efficiency models compatible with the site. Tank toilets will be replaced with dual flush devices so that liquid waste flushes (the most common) can be accomplished with less than 1 gallon of water. Vacuum models will be equipped to limit flush volumes to 1.6 gallons.

Because the operation of the evaporative coolers is so critical to the success of this project and the operation of the stores, this portion of the retrofit will require the most care. The work will be done under the supervision of the manufacturer of the equipment that has been selected by the owner for installation. Whoever is currently providing service to the cooling equipment will conform their operations to those directed by the manufacturer of the retrofit devices.

Currently, there are three technologies which appear most viable for the cooling towers. One uses ion exchange resins to remove calcium and magnesium from the circulation water, which is a traditional water softening approach. This system also uses chemical addition to prevent scale and bio film growth. The second approach uses an electrostatic field to stabilize the precipitate floc and prevent it from scaling out onto the metal, and the third accomplishes this through electro-magnetic fields. Both of the last two technologies claim to use a minimum of chemicals. All three have been approved for incentive funding by Los Angeles Water and Power, but there is still a certain amount of skepticism about the non-chemical approaches. This study will not endorse any of the technologies, but will seek to test them in an impartial manner. All manufacturers will be required to guarantee the performance of their equipment and in the event that it fails to operate as promised they will remove it and return the system to its original configuration, and make any necessary repairs. Performance bonds may be required.

All leaks identified in the audit and flow trace analysis will be repaired. Other miscellaneous water uses such as general washing or garbage disposal will be reviewed on a case-by-case basis and modified as practical within the project budget.

Post Retrofit Data Collection

Data will be obtained for 12 months after the completion of the retrofit that will allow an accurate estimate to be made of the water and energy savings brought about by retrofit. Additional data will be collected to document the performance of the installed equipment. (See Monitoring and Assessment section).

Schedule

The overall project will take 18 months to complete. Assuming a start date of July 1, 2001 the work up to completion of the retrofits is expected to be complete by November of 2001. The monitoring and evaluation will continue until November of 2002. The final report will be completed by the end of December 2002. A bar chart is attached. The project will span six quarters. A projection of cash flow by quarter is provided for budgetary purposes in Table 2

Table 2: Funding by Quarter

Quarter (Assuming July Start)	Co-funds	CalFed Funds
1 (July 2001)	\$27,000[a]	\$15,000
2 (Oct 2001)	\$27,000	\$40,000
3 (Jan 2002)		\$17,750
4 (Apr 2002)		\$17,750
5 (July 2002)		\$17,750
6 (Oct 2002)		\$17,750
Total	\$54,000	\$126,000

[a] This includes in-kind contribution from agencies

Monitoring and Assessment

The monitoring and assessment of this project should be a very straightforward process that yields accurate information on three questions: how much water is saved, how much energy is saved, and how do the technologies employed perform both functionally and economically.

After the completion of the retrofits, data collection will start on water, energy and performance parameters. Monthly water consumption will be collected via the normal billing process. Consumption by the evaporative cooler will be monitored by taking readings from the meter installed at the start of the project. Flow trace data will be collected from the main meter and the cooling meter at 1 month and 6 months post retrofit intervals. Energy data will be collected from monthly kwh readings taken by the utility. Since electricity use for the compressors is considered to be the most likely place where energy savings would be seen, only electricity consumption will be followed.

The performance of the evaporative coolers will be monitored through a series of on site inspections. These inspections will be conducted by a neutral party, using a protocol agreed to by all parties at the beginning of the study. The manufacturers will be free to conduct their standard maintenance, but must document all actions taken and time spent on the systems, so that this can be factored into the evaluation. The program will collect data that parallels the original audit data so the water chemistry, consumption and chemical use can be monitored. Biological and scale/corrosion tests will be done. These inspections will be conducted on a weekly basis for the first month after installation, and once every two weeks for the next two months, and then once per month thereafter. Reports will be filed with the project manager.

All data, or summaries as most appropriate, from the sites will be published on the website of the project consultant, with links posted on the AWWA WaterWiser site. At the end of the project a final report will be prepared listing all results along with the conclusions and recommendations drawn by the project team. The final report will be made available as an Adobe file over the web site.

QUALIFICATIONS OF APPLICANTS

The overall project manager will be Mr. William DeOreo, Aquacraft, Inc. Water Engineering and Management. Aquacraft has excellent credentials as consultant for the project because of their experience with the AWWARF Commercial and Institutional End Uses of Water Study (CIEUWS) in which Irvine, Los Angeles and Santa Monica participated, and their leadership in the efforts to provide hard data on water conservation technologies through data logging technology. Please refer to the company web site at l www.aquacraft.com.

In addition to Aquacraft, the water agencies have committed the services of the management personnel shown in Table 3 . These individuals, as can be seen from their resumes, are all highly experienced and in positions of responsibility in their respective organizations. They will insure that all of the commitments on the part of the agencies are fulfilled.

Table 3: Project managers for participating agencies

Agency	Responsible Party
Irvine Ranch Water District	Ms. Dale Lessick
Santa Monica Water	Mr. Neal Shapiro
Easter Water District	Mr. Ted Herring
Los Angeles Dept of Water and Power	Mr. Mark Gentile
San Gabriel Valley Municipal Water District	Ms. Elena M. Layugan

COSTS AND BENEFITS

Budget Summary

Table 4 provides a breakdown of the budget according to task for each study site, and shows the estimated cost per supermarket is $29,977. Of this, $9000 will be cost shared by the participating agency. This includes $1500 of in-kind services and $7500 towards the cost of the retrofit. Table 5 provides a breakdown of labor expenses for an individual supermarket, showing the total hours of each category of worker, the direct salary costs, benefits and indirect/overhead costs. These costs are based on Aquacraft's costs and overhead expenses. The projected direct expenses per supermarket are shown in Table 6.

Based on the unit costs shown in Tables 2 through 4 the cost to do a study involving 6 sites will be $179,862. Of this $54,000 will be cost-shared by the member agencies and the remaining $125,862 (rounded to $126,000) is the amount requested under this grant application.

Table 4: Budget Summary by Task Per Supermarket

SUMMARY OF COSTS BY TASK:				
TASK	DESCRIPTION	Labor	Expenses	Total
1	Study Group Select	$92	$1,500	$1,592
2	Baseline Data Collect	$257		$257
3	Site Audits	$1,960	$1,900	$3,860
4	Retrofits	$736	$11,700	$12,436
5	Post Retro Log 1	$1,224	$450	$1,674
6	Collect Post Retro Data	$1,408		$1,408
7	Monitor Cooling Systems	$1,460	$4,000	$5,460
8	Post Retro Log 2	$1,224	$450	$1,674
9	Web site	$780	$15	$795
10	Write Report	$796	$25	$821
	TOTAL FOR PROJECT	$9,937	$21,040	$29,977

Table 5: Details of Labor Expenses per Supermarket

LABOR COSTS DETAILS						
TASK	DESCRIPTION	RATE 1 Senior Engineer (Hrs)	RATE 2 Project Manager (Hrs)	RATE 3 Project Engineer (Hrs)	RATE 4 Analyst (Hrs)	Total (Hrs)
1	Study Group Select		1.00			1.00
2	Baseline Data Collect		1.00	1.00	2.00	4.00
3	Site Audits		10.00	16.00		26.00
4	Retrofits		8.00			8.00
5	Post Retro Log 1		2.00	16.00		18.00
6	Collect Post Retro Data		4.00	16.00		20.00
7	Monitor Cooling Systems			4.00	24.00	28.00
8	Post Retro Log 2		2.00	16.00		18.00
9	Web site			12.00		12.00
10	Write Report		3.00	8.00		11.00
	Total Hours Estimated		31.00	89.00	26.00	146.00
	Direct Costs		$891	$1,808	$406	$3,105
	Benefits		$178	$362	$81	$621
	Indirect/Overhead		$1,783	$3,616	$813	$6,211
	Total Labor Costs		$2,852	$5,785	$1,300	$9,937

Table 6: Breakdown of Expenses per Supermarket

DETAILS OF DIRECT EXPENSES								
TASK	DESCRIPTION	Cat 1 Supplies	Cat 2 Equipment	Cat 3 Services or Consultants	Cat 4 Travel	Cat 5 Rental	Cat 6 Other Direct Expenses	Total Total
1	Study Group Select	$ -	$ -	$ 1,500	$ -	$ -	$ -	$ 1,500
2	Baseline Data Collect	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3	Site Audits	$ -	$ 500	$ 500	$ 500	$ 400	$ -	$ 1,900
4	Retrofits	$ -	$ 10,950	$ 250	$ 500	$ -	$ -	$ 11,700
5	Post Retro Log 1	$ -	$ -	$ 50	$ -	$ 400	$ -	$ 450
6	Collect Post Retro Data		$ -	$ -	$ -	$ -	$ -	$ -
7	Monitor Cooling Systems		$ -	$ 4,000	$ -	$ -	$ -	$ 4,000
8	Post Retro Log 2		$ -	$ 50	$ -	$ 400	$ -	$ 450
9	Web site		$ -	$ -	$ -	$ 15	$ -	$ 15
10	Write Report		$ -	$ 25	$ -	$ -	$ -	$ 25
	TOTAL FOR PROJECT	$ -	$ 11,450	$ 6,375	$ 1,000	$1,215	$ -	$ 20,040

Budget Justification

The bulk of the costs for this project will be in expenses in install and monitor the water conservation equipment at each store. The largest single cost will be the equipment used for the evaporative coolers, for which $7500 per store has been allocated. Other conservation equipment will receive a $1500 per store budget. A sizeable amount of money has also been allocated to monitoring the cooling equipment for scale, biological growth and corrosion during the post retrofit period. This is a critical task for verification of the safety and reliability of the technologies used. The labor costs for the project are for time required to visit the sites, perform the audits and collect the necessary data. The analysis of the monthly and flow trace data is also part of the labor budget, along with the statistical analyses and report writing. A total of $1000 per store has been allocated for travel expenses.

Benefit Summary and Breakdown

The benefits to the customer will include lower water and sewer charges, and a possible reduction in electricity charges to the degree that the improvements to the cooling equipment improve its efficiency. Some of the water treatment technologies also offer benefits from reduced chemical use. For the time being we will ignore the energy and chemical savings, since they are harder to quantify. The anticipated water savings are conservatively estimated at 1150 kgal per year per store. This assumes a savings in the cooling use of 1000 kgal and in all other uses for 150 kgal. Data published by Kobrick indicate that a 200 ton evaporative cooler will reduce its overall water use by approximately 2600 gallons per day when its concentration ratio is increased from 3.0 to 7.0 (savings drop of quickly at higher CR values),[3] which provides a basis for projecting the cooling tower savings. The non-cooling use makes up approximately 40% of the total, or around 1800 kgal per year. In order to achieve a 150 kgal savings in these categories requires a reduction of less than 10%, which seems very modest.

Water and sewer rates in the study area average $2.60/kgal ($1.95/ccf). This ranges from a low of $.87/kgal to a high of $5.36. These are also not the top tier rates, so to the extent that much of the saved water will fall into this cost range the savings estimates are conservative. Assuming an average savings of $2.60/kgal of saved water, and an average annual savings of 1150 kgal results in a cost reduction of $2995 per year, which is considered a bare minimum estimate, which includes only savings from water and sewer charges.

The actual cost per customer to implement the water conservation technologies should be less than $9000 in standard applications. We have allocated that amount for this project since extra instrumentation and test equipment will be installed, but for working purposes an average cost of $7500 per store for retrofits is a reasonable estimate.

In addition to these very local benefits to the customer there are benefits which are harder to quantify which ripple through the State. First, there is a benefit to the water agency,

[3] Kobrick, Douglas and Wilson, M., *Uses of Water and Water Conservation Opportunities for Cooling Towers.* See figure 2, pg 1339. Proceedings of Conserve93, AWWA (1993)

which can use the saved water for other customers without having to purchase additional shares of water from MWD or the State Water Project. The major benefit, however, should accrue to the entire water resource system of the State of California as the results of this study are incorporated into the corporate planning of the retail food chains. If the responsible individuals are convinced of the technical and economic benefits of this approach to operating their stores, they will adopt them. The upper limit on the amount of water saved then becomes a function of how many supermarkets are located in California. In that sense, the money expended by the State on this project can be seen as seed money, which will yield geometric benefits.

Assessment of Costs and Benefits

The assumptions used for the present worth analysis are shown in Table 7. We are assuming that water and sewer rates average $2.61 per kgal, and that these remain stable relative to inflation over a ten year period, which is conservative since rates are likely to rise more quickly than inflation. The table shows an avoided cost to the water agency of $1.32/kgal which is the wholesale price paid for water by the agencies. However, since this savings is balanced by a reduction in revenue from the sale of the water, we are considering it a break even situation from the perspective of the agency and will not count savings to the agencies as benefits to the project for this analysis. Estimated water savings are 1000 kgal for the cooling systems and 150 kgal for all other categories, for a total of 1150 kgal per store per year. A discount rate of 6% has been used for the present worth analysis.

Table 7: Assumptions used for Economic Analysis

ASSUMPTIONS		
Rates		
W&S Rate ($/ccf)	$	1.95
W&S Rate ($/kgal)	$	2.61
Avoided Cost ($/kgal)	$	1.32
Water Savings		
Cooling (kgal)		1000
Other (kgal)		150
Total		1150
Discount Rate		6%

The present worth analysis for the project based on a 10 year period is shown in Table 8. Using the assumptions discussed above results in a present worth savings of over $22,000 per store ***in just water and sewer charges.*** With estimated costs per store of $7500 this results in a benefit/cost ratio of 2.94. When these savings are combined with potential, but un-included, savings is chemicals, energy and labor it is hard to see why a successful demonstration project here, would not result in widespread implementation of the technology throughout the State.

Table 8: Present Worth Analysis

PRESENT WORTH ANALYSIS										
Year	1	2	3	4	5	6	7	8	9	10
Water Savings	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
W&Sewer Rate	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61	$ 2.61
Water Cost Savings	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998	$ 2,998
Net Present Value to Customer	$22,066									

Summary

The project outlined in this proposal will provide important information for owners of supermarkets throughout the State of California, which will demonstrate the practicality of use of water conserving technologies in their stores. The main emphasis of the study will be a demonstration of the feasibility of use of advanced water technologies on evaporative cooling equipment. Many store owners have been reluctant to even investigate some of these technologies because of the lack of impartial data on their performance. In addition several other water conserving methods will be applied to the stores to test their effectiveness on reducing leakage and water waste.

Based on what are believed to be conservative estimates, the savings per store in water are expected to amount to at least 1150 kgal per year. At an average water and sewer charge of $2.60/kgal this results in an annual savings of just under $3000 per year, and a 10 year present worth of $22,066. Assuming a cost of $7500 per store to adopt these technologies leads to a benefit cost ratio of nearly three.

The other benefits to the agencies and the State of California depend on how one values the saved water. If the per store savings of 1150 kgal are expanded to, say 10,000 stores across the state the total saved water would equal over 35,000 acre feet of demand reduction, which could be justified by the savings to the store owners from just their reduced water and sewer charges, thus requiring little or no cost sharing on the part of the public agencies. The project directly addresses the BMP No. 9 for Conservation Programs for CII Accounts, and is, we hope, a good candidate for funding.

RESUMES

WILLIAM B. DeOREO, P.E.

TITLE:

President and Principal Engineer, Aquacraft, Inc. Water Engineering and Management
2709 Pine Street, Boulder, CO 80302.

WORK EXPERIENCE:

President and Principal Engineer, Aquacraft, Inc. Water Engineering and Management 1990-present.

Principal Engineer, Co- Founder of Hydrosphere, Inc., Boulder, Colorado, 1985-1990

Water Resource Engineer Wright Water Engineers, Denver, Colorado, 1980-1985

Utility Project Coordinator, City of Boulder, Boulder, Colorado, 1978-1980

AFFILIATIONS:

American Society of Civil Engineers

American Water Works Association

American Water Resources Association

Chi Epsilon, Tau Beta Pi. National Engineering Honor Societies

QUALIFICATIONS:

Mr. DeOreo has been actively practicing water engineering since 1978 after receiving his Master Degree in Civil and Environmental Engineering from the University of Colorado, Boulder. He has worked both in the public sector and as a private consultant. His main interests are in development of innovative supplies of water for municipal uses, improving the yield of urban water systems through better water planning and management, integration of urban water uses into watershed analyses, and development of computer based applications to assist with water planning. Mr. DeOreo is a member of the Planning and Evaluation sub-committee of the AWWA Water Conservation national committee. Some specific capabilities include:

- Water Rights Hydrology
- River Basin Allocation Modeling
- Water Systems Planning and Demand Forecasting
- Water Conservation Studies

- GIS/Computer applications for Water Systems Management
- Specialized Studies on Disaggregated Water Use

Mr. DeOreo has participated in urban drainage master planning projects, large water rights transfers and augmentation plans, raw water master plans and numerous water utility related projects such as leak detection, hydraulic modeling and rate studies. He has a broad understanding of the technical, environmental and economic issues involved with water resources in Colorado and the West. He has testified as an expert witness in Water Court.

Under his direction, Aquacraft, Inc. has concentrated it in the area urban water management, and has created several innovative approaches to providing a more rigorous basis for analysis of water use. The most important of these has been the Trace Wizard system for collection and disaggregation of water use data via analysis of flow traces obtained from the customer water meter. This analysis technique allows precise information to be collected on how much water is devoted to each end-use by residential users; and in turn, allows water providers to collect baseline data for planning purposes and to assess the effectiveness of water conservation programs on an ongoing basis. The technique can also provide accurate information on the impacts of water conservation on customer demands. He has many publications in the literature providing data and results of the various studies on which he has worked. These publication help make the information widely available to others in the profession.

SELECTED PROJECTS:

- East Bay MUD Conservation Retrofit Study, (2001-02)

This water efficiency retrofit study will measure the impact of high performance plumbing fixtures in 35 single-family homes in the Oakland California metropolitan area. Each home in the study will be fully retrofit with ULF toilets, conserving clothes washers, LF showerheads, and LF faucet fixtures. Aquacraft will collect flow trace data from each home before and after the retrofits so that the impacts of each fixture class can be measured and the cost-effectiveness evaluated. This study is funded by the US Environmental Protection Agency and EBMUD.

Contact: Mr. Dick Bennett, EBMUD (510) 287-0597

- CII Demand Assessment and Conservation Plan, Westminster, CO, (2000-01)

The City of Westminster, a suburb of Denver has experienced substantial growth in the commercial, industrial, and irrigation sectors. Aquacraft evaluated trends in water use for this sector using available billing data and information from the local tax assessor and then developed a detailed water conservation plan targeted at these customers. Ten site audits were conducted to assess the conservation potential of individual customers. The final report is in the review process.

Contact: Mr. Kelly DiNatale, City of Westminster (303) 430-2400

- Commercial and Institutional End Uses of Water, AWWARF,(1998-2000)

This study evaluated water use among commercial and institutional end uses of water in five cities. This study provided information on the most significant commercial and institutional customers in typical municipal water systems and the purposes for which these customers use water. Aquacraft was the prime contractor for this project. Our role in this study, beyond project management, was to conduct direct measurement field studies of CI demand and to assemble and edit the final report. We performed detailed water audits in 24 sites ranging in size from small restaurants to large high school campuses and implemented a variety of water use measurement programs to determine where water is used in these settings. The final report is available for purchase from AWWA.

Contact: Mr. Robert Allen, AWWARF (303) 347-6103

DALE A. LESSICK

Education

University of California Irvine, MBA, 1994

University of California Los Angeles, BAs, Psychology and Philosophy, 1985

Experience

CTSI Corporation, Senior Project Manager, 1994-to date

- Currently directing the Water Efficiency Program for Irvine Ranch Water District. Filling all responsibilities typical to a Conservation Coordinator, such as program design and implementation for all BMPs, cost-effectiveness calculations, creating materials and disseminating public information, serving on various conservation-related committees at the state and local levels, and serving as the main information source for agency staff and directors on water conservation legislative issues. Explore new technologies showing promise for greater efficiency, especially in commercial, industrial, and institutional (CII) sites.
- Designed for client residential survey conservation program, including the financial feasibility of the entire project. Responsible for all aspects of the program, including the recruitment and training of the surveyors and support staff, inventory, customer service, databases, reports, and monitored and improved individual surveyors' productivity. Served as the program integrator between the 20+ surveyors in the field, the 10+ CBO staff, the out-of-state subcontractor, and the 30+ water agency representatives.
- Supervised Community-Based Organizations operating ULF Toilet distribution programs. Responsible for marketing outreach campaigns; inventory control; database management; training on program operations, policies and procedures; and safety compliance for the Metropolitan Water District of Southern California and San Diego County. Ensured CBOs complied with program regulations, maintained accuracy in record-keeping, and followed up on customer service issues. Motivated CBOs to meet project goals. Supervised the San Diego County CBOs on successfully implementing several special events for the County's subagencies.
- Acted as project manager in the largest single- and multi-family retrofit program in the US. Served as the project head for the only ULF Toilet distribution location under direct CTSI control, resulting in the only location to realize100% accuracy in all its record-keeping, as well as to achieve the highest level of productivity (the greatest number of customers reached and fixtures installed) per employee. Implemented a variety of management experiments which proved successful and which have been incorporated into other projects to improve overall performance. Created direct promotional and communication materials required for the program.
- Co-creator of the CTSI multi-family water conservation training program, which resulted in 90% of the participants implementing recommendations from the program. Created and wrote the accompanying training manual which details the training and includes such information as how to read the meter, calculating savings on plumbing retrofits, leak detection, resident motivation, and information specific to the participating water agency.

Elena M. Layugan

EDUCATION

University of Southern California, Los Angeles, Masters of Public Administration, 1991

University of Southern California – Los Angeles, Masters of Planning, 1990

Loyola Marymount University, Los Angeles BA, Urban Studies, 1988

Kansai Gaidai University - Hirakata, Japan, Study Abroad - Fall Semester, 1986

WORK EXPERIENCE

Upper San Gabriel Valley Municipal Water District - *El Monte, CA*

Conservation Coordinator, *1992 to Present*

- Develop, implement, manage and evaluate district-wide conservation and education programs. Model, justify and administer fiscal budget for conservation and education programs.
- Engage in committees that actively formulate, research and determine feasible technologies, methodologies, standards and practices in relation to water efficiency.
- Formulate conservation policies and programs and provide recommendations to General Manager and Board of Directors. Provide input and guidance for conservation policies and legislation at federal, state and local levels.
- Interact directly with elected officials, general manager, public agencies, utilities, private businesses, non-profit organizations and the general public.
- Function as voting representative on the California Urban Water Conservation Council.
- Write and administer legal agreements and grant proposals. Author, present and publish findings and articles regarding conservation programs and approaches.
- Supervise and direct staff, consultants and vendors in administering various programs and events.
- Coordinate and oversee volunteer events with as many as several hundred participants of all ages.
- Create diverse informational materials and programs for public outreach efforts
- Conduct presentations and workshops for diverse audiences. Respond to public concerns regarding water quality, reclamation and conservation questions and issues.
- Designed and maintain agency's initial Internet web site.

Los Angeles Department of Water and Power - *Los Angeles, CA*

Consultant - Suggestion Plan Office and Employees' Association *1991 – 1992*

Administrative Intern - Employees' Association *1990 - 1991*

- Conduct presentations and workshops for diverse audiences.
- Processed employee suggestions: summarized suggestions/evaluations, input data, tabulated awards, and developed promotional strategies.
- Assisted with developing fiscal budget requests and justifications.
- Implemented data reorganization and spatial reassessment projects.
- Researched and compiled historical data concerning the Association.
- Aided in processing information for Donor's Welfare Plan and Mutual Benefit Plan.

TED F. HARING

Public and Legislative Affairs Officer
Eastern Municipal Water District
(Riverside County)

Haring has several years of experience as a chamber of commerce and association executive in Idaho, Oregon and California. Previous to that time, he was employed in administrative management with Standard Oil Company of California in San Francisco.

His education is varied with business administration and industrial relations at UC Berkeley, followed by advanced courses through the Institute for Organization Management at Santa Clara and San Jose State Universities. He is also a graduate of a specified master's program through the Academy of Organization Management at the University of Notre Dame, where he completed a thesis.

Ted has served in a leadership capacity in many state and national associations and has received several awards for excellence in his profession as a chamber of commerce/association CEO.

During his nearly ten years with Eastern Municipal Water District, he has garnered state-wide recognition for many of the District's water conservation and resource management projects. Haring conducts community involvement and water use efficiency programs throughout EMWD's large service area. Also serving as the agency's state legislative analyst, he represents Eastern on the Legislative Committees of the Association of California Water Agencies and the California Municipal Utilities Association.

He is also a member of the American Water Works Association, where he serves on the Governmental Coordination and Conservation Committees.

NEAL SHAPIRO

EXPERIENCE

City of Santa Monica, Santa Monica 1999 to Present

Water Resources Section Head/Urban Runoff Management Coordinator

- Manage the City's multi-departmental stormwater and urban runoff programs.
- Speak to public groups and schools about urban runoff and watershed management.
- Inspect new development to meet Federal urban runoff regulations.
- Promote the harvesting of stormwater and dry weather runoff for percolation.
- Write reports, contracts and city ordinances.
- Prepare budgets.
- Train City employees and contracts on best management practices for urban runoff control.
- Participate in local, state and federal task forces and councils on watershed management.

WaterWatch of Southern California, Los Angeles 1994 to 1999

Independent Consultant

- Sub-contractor, Department of Water & Power, Los Angeles, Water Conservation Ordinances, research and process appeals by customers for relief from the ordinance, November, 1998, open-ended.
- Sub-contractor, Jones & Stokes Associates, Sacramento, Transagency Resources For Environmental and Economic Sustainability Program, TREES, cost-benefit analysis model to restore the urban ecosystem in Los Angeles, local water conservation and capture. Water conservation and harvesting research. Project for TreePeople, Los Angeles. November, 1996 to March, 1998. Presently, ongoing research and design charette for stormwater harvesting via the TREES process.
- Managing Editor for a local newspaper, 1995.
- Compiled data on water reclamation in the United States for use in the Middle East, October, 1994.
- Evaluated water efficient strategies in Los Angeles County earthquake repairs, Summer, 1994.
- Taught a course on environmental opportunities through a local learning exchange program, First Quarter, 1993.
- Film researcher and developer for Spielberg's SeaQuest television program. Compiled information about the oceans and developed script concepts for episodes. Reviewed scripts for accuracy, Fall 1992 - Summer 1994.

Office of Water Reclamation, Los Angeles 1992 to 1994

- Editor of OWR NEWS, the office newsletter.
- Drafted ordinances and regulations to legalize the use of reclaimed and gray waters.
- Educated government officials and water managers on the benefits of reusing highly treated waste water and of setting goals for water reclamation in terms of a future local water supply.

- Informed the public about potential uses of reclaimed water.
- Produced reports on water reuse, including various figures and tables and wrote articles for conferences

The Cousteau Society, Los Angeles 1983 to 1993

- Analyzed human impacts on the global environment to identify patterns and relationships, and suggested effective alternative strategies to improve the quality of life and preserve long-term economic vitality.
- Wrote environmental policy analyses and public statements on major environmental issues, and articles for magazines.
- Fostered rapport with industry, government and academia to support educational projects.
- Developed strategies for sustainable use of natural resources, such as water, energy and solid wastes.
- Gave oral presentations at workshops, conferences and hearings.

EDUCATION

Legal Principles in Site Investigation and Remediation, UCLA Continuing Education, Hazardous Waste Program, 1995

Master of Marine Policy, University of Delaware, Graduate Scholarship, 1982

Multi-disciplinary degree including legal, economic, political and administrative dimensions of maritime conflict resolution and marine resources management.

Bachelor of Arts, Aquatic Biology, University of California, Graduated *cum laude* honors, 1978

MARK GENTILI
2260 Via Saldivar
Glendale, CA 91208

EDUCATION

Bachelor of Arts Degree in Biological Sciences ant the University of California, Santa Barbara, May 1982. Continuing my education at Glendale College in anticipation of transferring to UCLA for M.S. in Computer Sciences

EXPERIENCE

Los Angeles Department of Water and Power **03/'91 – present**

- Water Conservation Specialist: Contract Administrator for three water conservation programs. Running day-to-day operations for all water conservation programs at LADWP. In charge of two LADWP employees and thirty contractual employees.

- Computer Support Programmer: Develop programs in Visual Basic to extract customer data from mainframe applications. Network administrator for 35 employees.

- Account Executive: In charge of $10M worth of accounts. Extensive work with customers to improve their relationships with LADWP.

- Residential Outreach Representative and Project Coordinator: Complete administration and coordination of commercial energy-efficiency programs

City of L.A. Glendale - L.A. Reclamation Plant, Los Angeles, CA **09/'89 - 03/'91**

- Industrial Waste Inspector: Complete and detailed audits of industrial-waste--producing companies. Good knowledge of sampling techniques; both manual and automatic. Interviewing key personnel as to operation of their treatment systems.

- City of L.A. Hyperion Treatment Plant, Playa Del Rey, CA 02/'89 - 09/'89

- Laboratory Technician 1: Collected samples directly from ocean, bay, creek and Hyperion Plant locations. Making media and buffer solutions. Filtering samples, inoculation of media tubes, Quality Assurance, and data entry.